Overview of Accuracy Scenario Generation Task

FAA William J. Hughes Technical Center

ACT-250 CP Assessment Team

Presented by Team Lead

Mike Paglione

December 16, 1999

Briefing Outline

- Overall Task Description
- Schedule
- Methodology

Overall Task Description*

- **Develop the necessary tools**, infrastructure and documentation required to create URET CCLD accuracy scenarios that represent the characteristics of the Design Workload.
- **Participate in the data collection** of field data required for development of the URET CCLD accuracy scenarios.
- **Develop a sample version and two actual URET CCLD traffic scenarios** for the accuracy testing for FAA s acceptance testing of URET CCLD.
- **Perform a trajectory accuracy analysis** using the developed accuracy scenarios on URET daily use system so that AUA-200 can refresh the URET CCLD system specification accuracy metrics.

*Source: FY99 and FY00 PDs

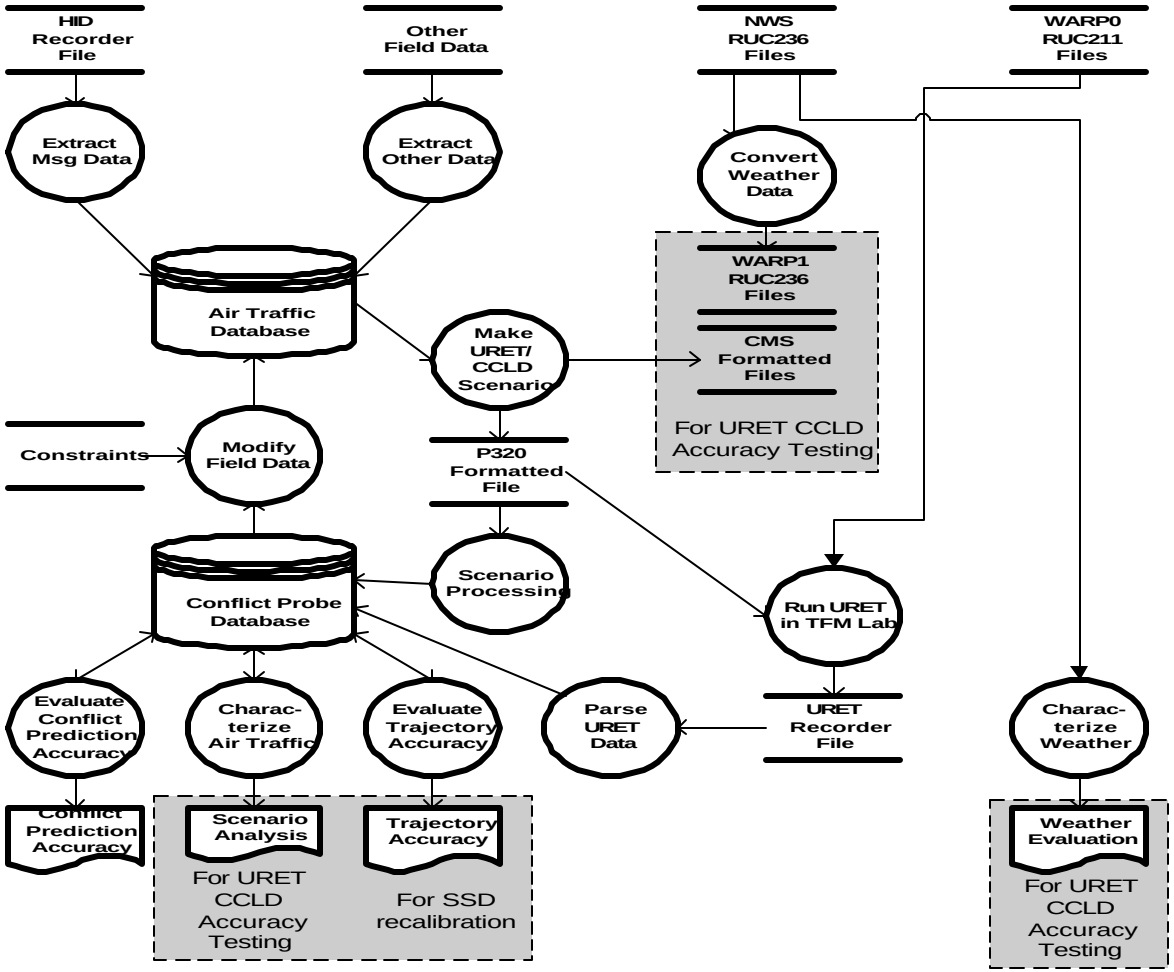
Main Task Item Schedule

- FY99 PD
  - Trajectory Accuracy Report
    - » completed 5/99 ✓
  - Develop Necessary Tools
    - » ongoing
  - Scenario Characteristics Paper
    - » delivered review draft 9/14/99 ✓
    - » received comments by 9/30/99 ✓
    - » final 12/99

Main Task Schedule Cont d

- FY00/01 PDs
  - Sample Scenario (CMS format)
    - » delivery date 1/00
  - Sample Trajectory Analysis
    - » completion date 4/00
  - Initial Accuracy Scenario
    - » delivery date 7/00
  - Final Accuracy Scenario
    - » delivery date 11/00

Methodology



--Backup Slides--
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Air Traffic Database

- **Bookkeeping tables**

  contain data set and run identification information

- **Flight tables**

  contain flight-centric message data

- **Environment tables**

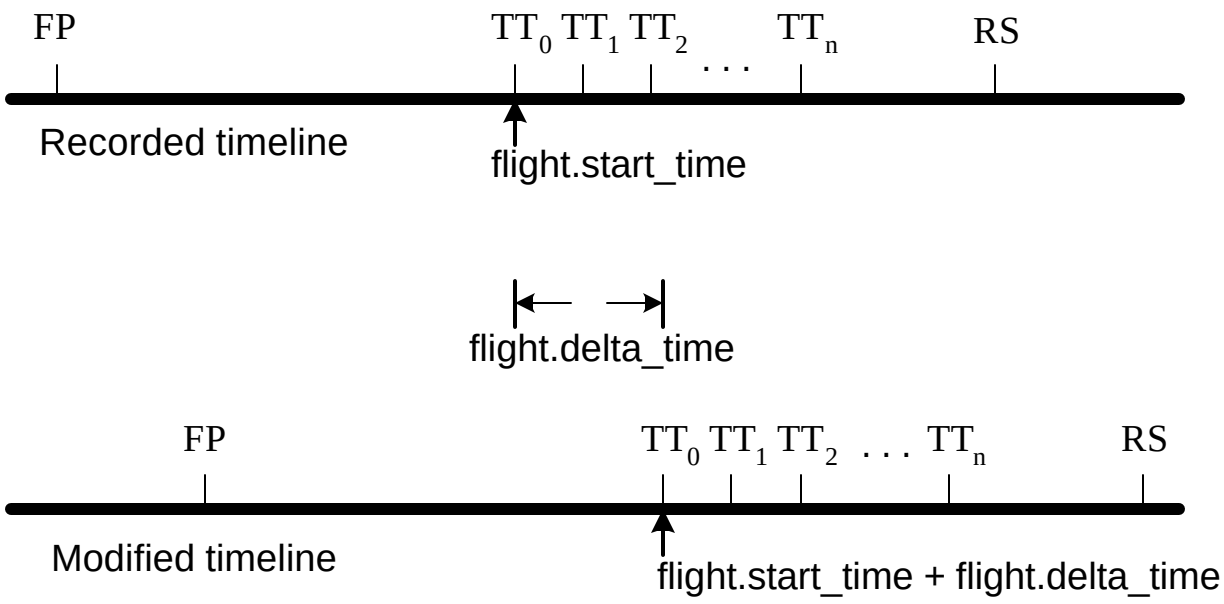
  contain center specific data

Flight-Centric Message Data

- A flight is established for each unique ACID/CID with a flight plan message.
- Each flight has a *start_time*, which is the time of the flight s first recorded track message.
- All other event times associated with a flight are relative to this *start_time*.
- Each flight also has a *delta_time* which

  can be adjusted by software to create different scenarios by changing the time events associated with flights.

Example of Modifying a Flight by *delta_time*



Messages shown using P320 message type codes

Field Data Processing Programs

***ext*:** Extracts message data from a HID recorder file and inserts data into the Air Traffic Database

***sgp*:** Selects data from Air Traffic Database and generates requested scenario file(s)

***odo*:** Creates runs using time shifting

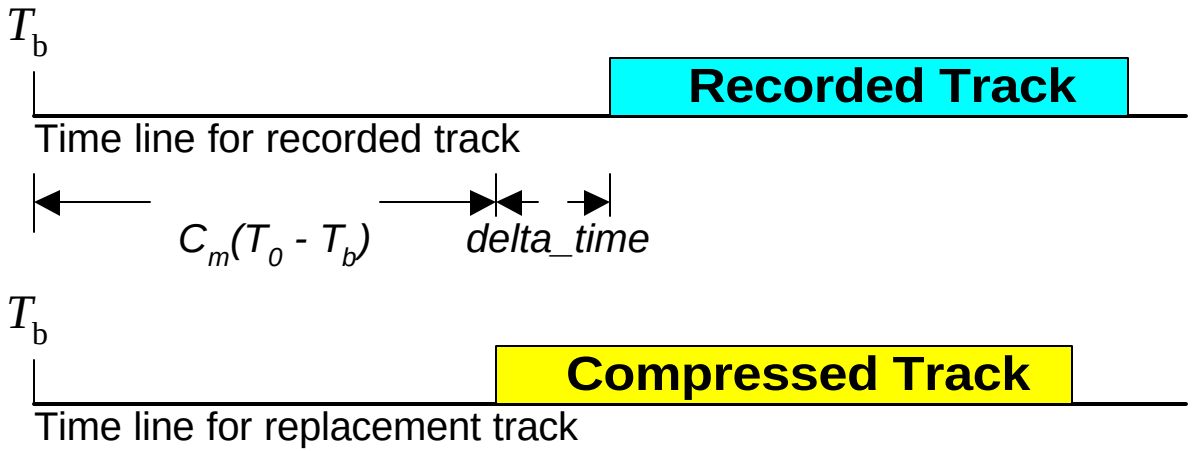
P320 Formatted Scenario File

- ASCII file.
- Mutation of HCS 3.20 patch messages
- Defined by MITRE for URET testing
- Used to perform trajectory analysis for recalibration of the URET CCLD SSD

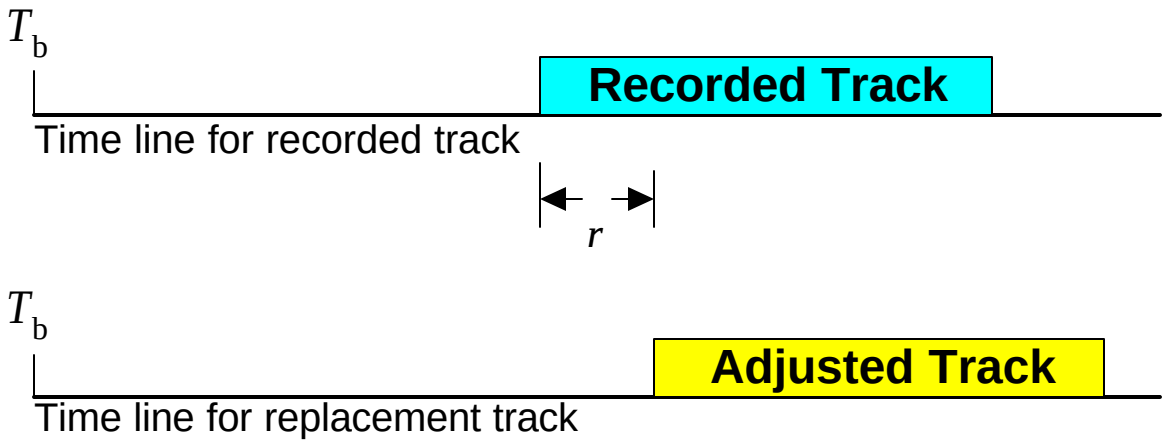
CMS Formatted Scenario File

- Determined P320 HID recorder file format
  - Worked with MITRE
  - Provided this information to LMATM
- LMATM wrote SIG 264 to specify its contents and format
  - ACT-250 is a member of the Concurrent Engineering Team
- File containing a hodgepodge of:
  - ASCII encoded headers
  - Binary data
  - EBCDIC encoded messages
- Using IRD dated August 23rd plus RPRs to be specified by LMATM

Scenario Time Compression



Random Time Adjustment



Definition of Aircraft to Aircraft Encounter & Conflict

- For encounter, aircraft pair separated by:
  - less than 30 nm horizontally
  - less than legal separation vertically
    (i.e. 1000 ft at or below FL 290 and 2000 ft above)
- For conflict, aircraft pair separated by:
  - less than 5 nm horizontally
  - less than legal separation vertically
    (same as encounter)

Design Considerations in Encounters/Conflicts

- Encounter Exceptions
  - Encounter ends but resumes within 5 minutes or less, is considered single encounter
  - Encounter with track time gap is considered single encounter if it resumes within 5 minutes or less
  - Exclude encounters with duration of ≤ 10 seconds
  - Aircraft in cruise assumed at assigned altitude for separation calculations if within 300 ft of assigned altitude

Design Considerations in Encounters/Conflicts Cont d

- Flight Plan Adherence

  lateral adherence age calculated using reference time based on constraint table (*Table 3.2-1 and 3.2-2) where minimum horizontal separation falls

  thresholds vertical flight plan adherence in SSD and thresholds for lateral flight plan adherence being evaluated

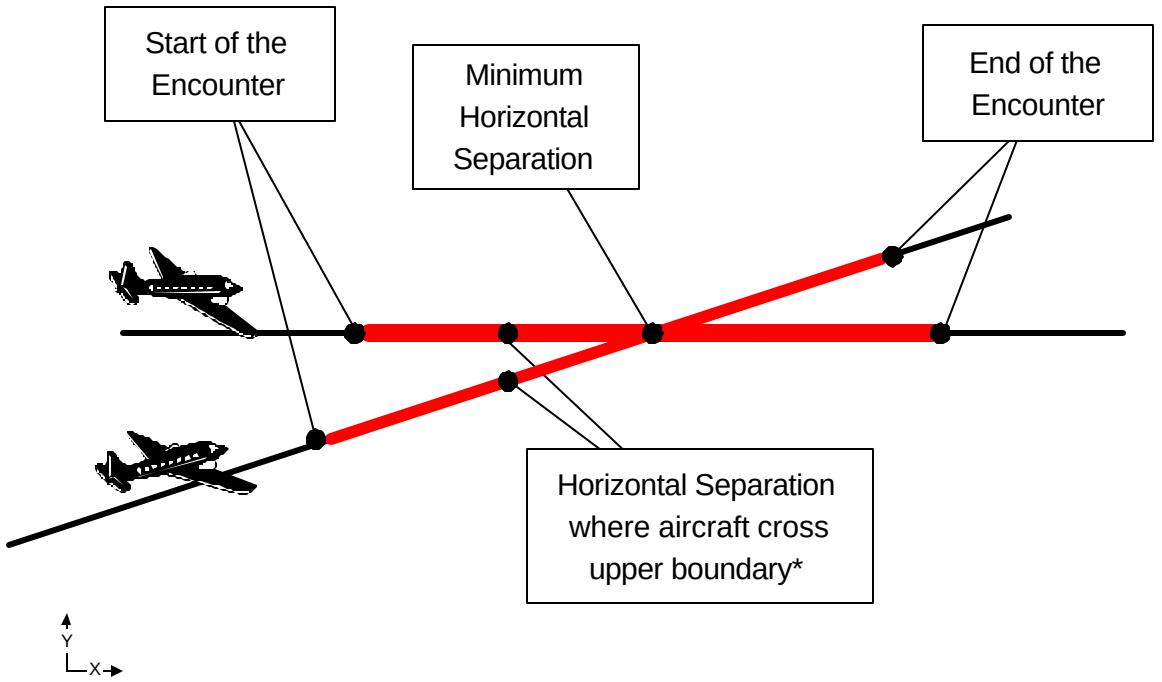
*Source: *Description of Accuracy Scenarios for the Acceptance Testing of URET CCLD,* Review Draft 9/14/99

Table 3.2-1: Current Plan Aircraft to Aircraft Encounter Counts*

Minimum Horizontal Separation (nm)	Total Number of Encounters Required
0 <= d < 5	506
5 <= d < 10	506
10 <= d < 15	506
15 <= d < 23	506
23 <= d < 30	506

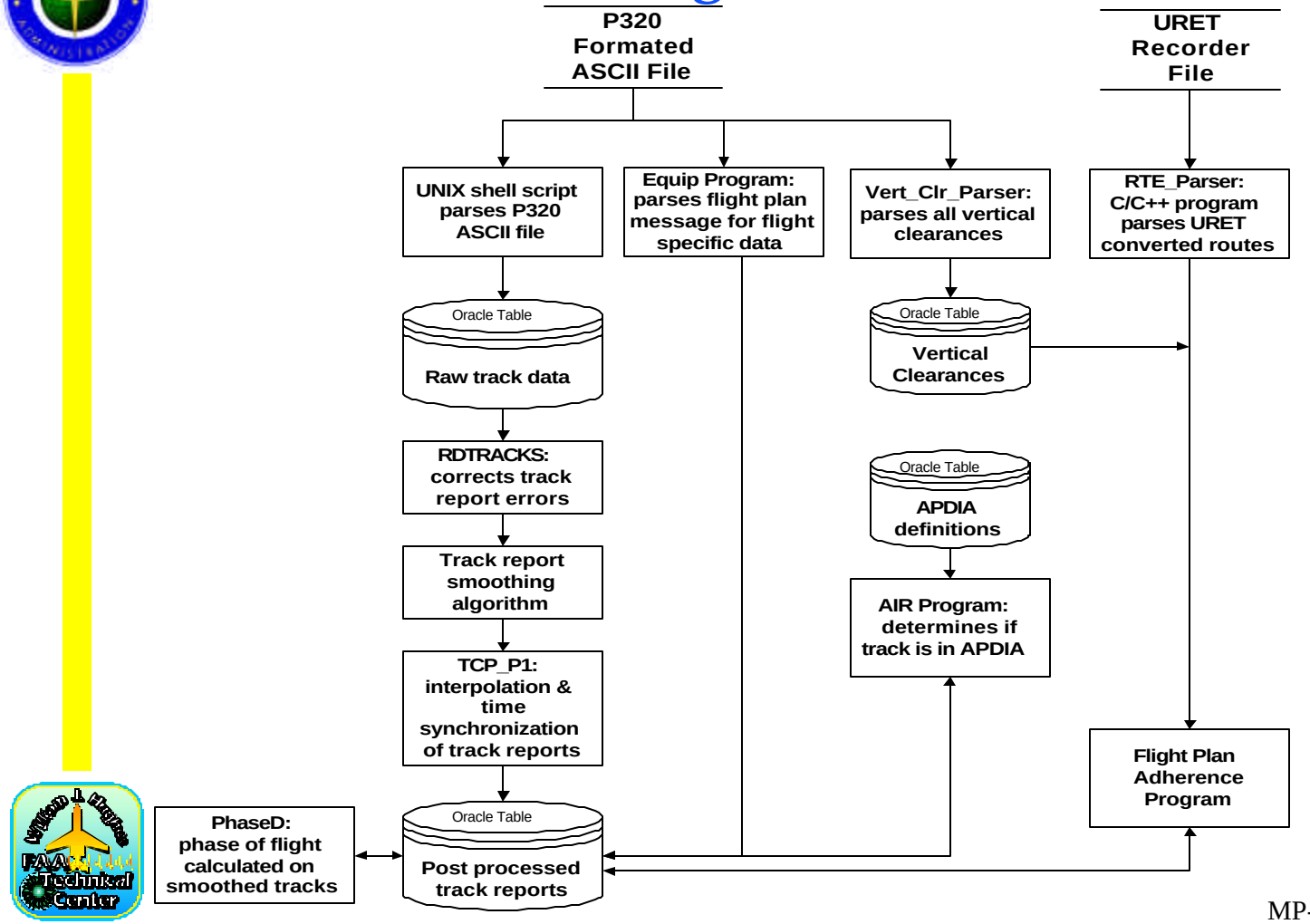
*Source: *Description of Accuracy Scenarios for the Acceptance Testing of URET CCLD*, Review Draft 9/14/99

Example Encounter & Lateral Adherence



*Upper boundary found in Table 3.2-1 and 2 in *Description of Accuracy Scenarios for the Acceptance Testing of URET CCLD*, Review Draft 9/14/99

Scenario Processing&Parse URET Data



Track Conflict Probe (TCP)

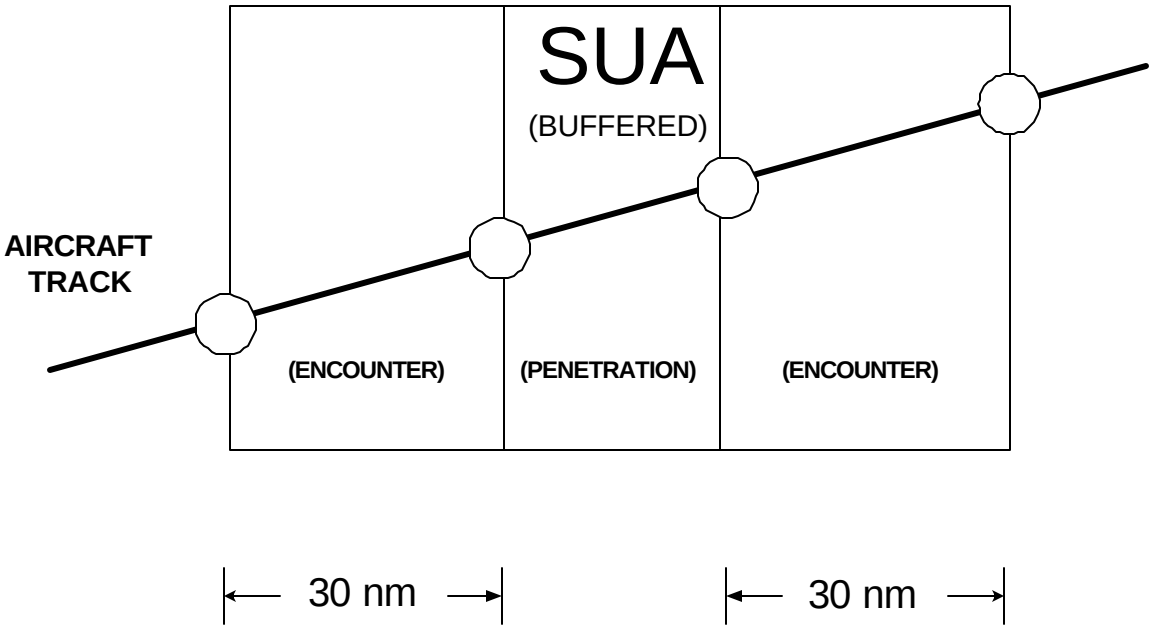
- Input: Post Processed Track Reports
- Output: Two Oracle Database Tables

  Encounter List - lists encounter information
  - » aircraft pair identification
  - » encounter start and end times (XYZT)
  - » adherence age at reference time
  - » minimum separations and their times
  - » encounter angle and phase of flight

  Aircraft Minsep List - lists pairs that simply passed Gross Filter (around entire flight 35nm & 3000ft)
  - » minimum separations and their times
  - » altitude at minimum horizontal separation

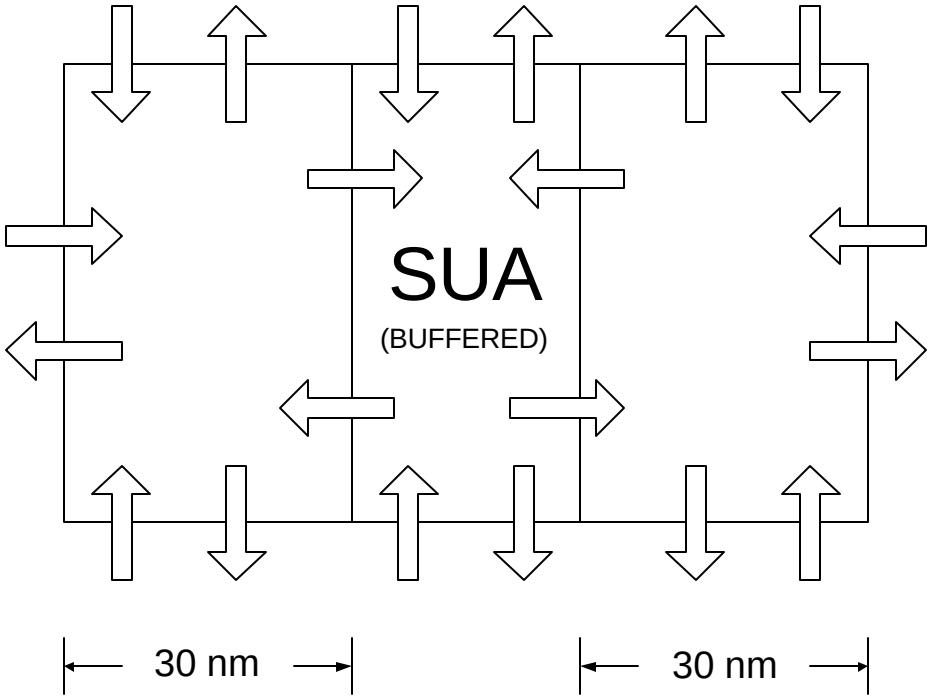
Special Use Airspace Penetrations

BOUNDARY CROSSINGS:



ENCOUNTERS & PENETRATIONS - SUA
SIDE VIEW

Encounter Geometry



ENCOUNTERS & PENETRATIONS - SUA
SIDE VIEW

Scenario Metric Categories

- Center Airspace
- Encounters
- Air Traffic
- Aircraft
- Interfacility Traffic Flow
- Flight Plan Adherence
- Weather Forecasts